Claims:

1. Closed-loop neural modulation for the control of epilepsy

2. Closed loop neural modulation apparatus as in claim 1, with at least one electrode positioned within any of the ventricles

3. Closed loop neural modulation apparatus as in claim 1, with at least one electrode positioned in contact with the CSF

4. Closed loop neural modulation apparatus as in claim 1, with at least one electrode positioned in contact with the CSF lining the convexity of at least one cerebral or cerebellar hemisphere

5. Closed loop neural modulation apparatus as in claim 1, with at least one electrode positioned in contact with the CSF lining the convexity of the hippocampus

6. Closed loop neural modulaton apparatus as in claim 1, with at least one electrode positioned in contact with the CSF lining the convexity of the portion of the cortex to be controlled.

7. Closed loop neural modulation apparatus as in claim 1, wherein a voltage potential gradient is established along the soma-axonal axis of the neuron.

8. A system for neural modulation in the treatment of disease, comprising:

(A) a signal conditioning circuit

(B) a sensor array in electronic communication with said signal conditioning circuit;

(C) a signal processor in electronic communication with said signal conditioning circuit

(D) a control circuit in electronic communication with said signal processor

(E) an output stage circuit in electronic communication with said control circuit

(F) a stimulating electrode array, in electronic communication with said output circuit

(G) a power conversion unit in electromagnetic communication with an electromagnetic coil and in electronic communication with at least one of said sensor array, said signal conditioning circuit, said signal processor, said control circuit, said output stage circuit, said stimulating electrode array.

9. A system for neural modulation in the treatment of disease, comprising:

(A) a signal conditioning circuit

(B) a sensor array in electronic communication with said signal conditioning circuit;

(C) a signal processor in electronic communication with said signal conditioning circuit

(D) a control circuit in electronic communication with said signal processor

(E) an output stage circuit in electronic communication with said control circuit

(F) a stimulating electrode array, in electronic communication with said output circuit

(G) a power conversion unit in electronic communication with at least one of said sensor array, said signal conditioning circuit, said signal processor, said control circuit, said output stage circuit, said stimulating electrode array

10. A system for neural modulation in the treatment of disease, as recited in claim 9, further comprising an electromagnetic coil in electromagnetic communication with said power conversion unit.

11. A system for neural modulation in the treatment of disease, as recited in claim 10, wherein said electromagnetic coil is external to the body.

12. A system for neural modulation in the treatment of disease, as recited in claim 10, wherein said system is implanted in the body.

13. A system for neural modulation in the treatment of disease, as recited in claim 11, wherein said system is implanted in the body.

14. A system for neural modulation in the treatment of disease, as recited in claim 9, further comprising a multiplicity of electromagnetic coils in electromagnetic communication with said power conversion unit.

15. A system for neural modulation in the treatment of disease, as recited in claim 14, wherein said multiplicity of electromagnetic coils are mutually orthogonal.

16. A System for neural modulation in the treatment of disease, as recited in claim 14, wherein said multiplicity of electromagnetic coils have intersecting electromagnetic fields.

17. A system for neural modulation in the treatment of disease, as recited in claim 14, wherein said multiplicity of electromagnetic coils are spaced to have overlapping electromagnetic fields.

18. A system for neural modulation in the treatment of disease, as recited in claim 14, wherein said multiplicity of electromagnetic coils are spaced to have non-overlapping electromagnetic fields.

19. A system for neural modulation in the treatment of disease, as recited in claim 14, wherein said multiplicity of electromagnetic coils are positioned such that at least one said electromagnetic coil is in electromagnetic communication with said system.

20. A system for neural modulation in the treatment of disease, as recited in claim 14, wherein said multiplicity of electromagnetic coils are positioned such that at least one said electromagnetic coil is in electromagnetic communication with a component of said system.

21. A system for neural modulation in the treatment of disease, as recited in claim 19, wherein said multiplicity of electromagnetic coils are energized sequentially.

22. A system for neural modulation in the treatment of disease, as recited in claim 19, wherein said multiplicity of electromagnetic coils are energized in a time-multiplexed manner.

23. A system for neural modulation in the treatment of disease, as recited in claim 19, wherein said multiplicity of electromagnetic coils are positioned such that said electromagnetic communication is maintained regardless of position or orientation of said system.

24. A system for neural modulation in the treatment of disease, as recited in claim 19, comprising two electromagnetic coils.

25. A system for neural modulation in the treatment of disease, as recited in claim 19, comprising three electromagnetic coils.

26. A system for neural modulation in the treatment of disease, as recited in claim 19, comprising at least two electromagnetic coils.

27. A system for neural modulation in the treatment of disease, as recited in claim 10, further comprising a coil holder in mechanical communication with said electromagnetic coil.

28. A system for neural modulation in the treatment of disease, as recited in claim 27, wherein said coil holder is constructed from a flexible material.

29. A system for neural modulation in the treatment of disease, as recited in claim 27, wherein said coil holder is constructed from materials that include cloth.

30. A system for neural modulation in the treatment of disease, as recited in claim 27, wherein said coil holder is constructed to further serve the function of a head rest.

31. A system for neural modulation in the treatment of disease, as recited in claim 27, wherein said coil holder is constructed to further serve the function of a pillow.

32. A system for neural modulation in the treatment of disease, as recited in claim 27, wherein said coil holder is constructed to further serve the function of a hat.

33. A system for neural modulation in the treatment of disease, as recited in claim 27, wherein said coil holder is constructed to further serve the function of a helmet.

34. A system for neural modulation in the treatment of disease, as recited in claim 27, wherein said coil holder is constructed to further serve the function of a head band.

35. A system for neural modulation in the treatment of disease, as recited in claim 27, wherein said coil holder is constructed to further serve the function of a bandanna.

36. A system for neural modulation in the treatment of disease, as recited in claim 27, wherein said coil holder is constructed to further serve the function of any apparatus or apparel worn on or about the head.

37. A system for neural modulation in the treatment of disease, as recited in claim 9, said power conversion circuit further including an energy storage element.

38. A system for neural modulation in the treatment of disease, as recited in claim 9, said power conversion circuit further including a capacitor serving as an energy storage element.

39. A system for neural modulation in the treatment of disease, as recited in claim 9, said power conversion circuit further including a rechargeable battery serving as an energy storage element.

40. A system for neural modulation in the treatment of disease, as recited in claim 9, said system implanted under the skin in close proximity to the head.

41. A system for neural modulation in the treatment of disease, as recited in claim 9, said system implanted under the scalp.

42. A system for neural modulation in the treatment of disease, as recited in claim 9, said system devoid of subcutaneous tunneled cables.

43. A system for neural modulation in the treatment of disease, as recited in claim 9, said system devoid of subcutaneous tunneled cables and risk of fracture thereof.

44. A system for neural modulation in the treatment of disease, as recited in claim 9, said system devoid of any moving parts or deformation of flexible parts.

45. A system for neural modulation in the treatment of disease, as recited in claim 9, said system configured for implantation under the scalp.

46. A system for neural modulation in the treatment of disease, as recited in claim 9, said system further comprising mechanical attachment facilitating secure attachment to calvarium.

47. A system for neural modulation in the treatment of disease, as recited in claim 9, said system further comprising screw mount facilitating secure attachment to calvarium.

48. A system for neural modulation in the treatment of disease, as recited in claim 9, said system further comprising mechanical attachment facilitating secure attachment to calvarium, devoid of cables traversing the neck..

49. A system for neural modulation in the treatment of disease, as recited in claim 9, said system further comprising mechanical attachment facilitating secure attachment to calvarium, said system with longest extracranial dimension less than 15 inches.

50. A system for neural modulation in the treatment of disease, as recited in claim 9, said system further comprising mechanical attachment facilitating secure attachment to calvarium, said system with longest extracranial dimension less than 10 inches.

51. A system for neural modulation in the treatment of disease, as recited in claim 9, said system further comprising mechanical attachment facilitating secure attachment to calvarium, said system with longest extracranial dimension less than 5 inches.

52. A system for neural modulation in the treatment of disease, as recited in claim 9, said system further comprising mechanical attachment facilitating secure attachment to calvarium, said system with longest extracranial dimension less than 3 inches.

53. A system for neural modulation in the treatment of disease, as recited in claim 9, said system further comprising mechanical attachment facilitating secure attachment to calvarium, said system with longest extracranial dimension less than 1 inch.

54. A system for neural modulation in the treatment of disease, as recited in claim 9, said system further comprising a recessed component.

55. A system for neural modulation in the treatment of disease, as recited in claim 9, said system further comprising a recessed component and a protruding component.

56. A system for neural modulation in the treatment of disease, as recited in claim 9, said system further comprising a recessed component and at least one screw mount.

57. A system for neural modulation in the treatment of disease, as recited in claim 9, said system further comprising a recessed component and a protruding component and at least one screw mount.

58. A system for neural modulation in the treatment of disease, as recited in claim 9, said system further comprising a recessed component and at least one mechanical attachment.

59. A system for neural modulation in the treatment of disease, as recited in claim 9, said system further comprising a recessed component and a protruding component and at least one mechanical attachment.

60. A system for neural modulation in the treatment of disease, as recited in claim 9, said system further comprising a recessed component occupying space vacated by removed portion of calvarium.

61. A system for neural modulation in the treatment of disease, as recited in claim 9, said system further comprising a recessed component occupying space vacated by removed portion of calvarium outer table.

62. A system for neural modulation in the treatment of disease, as recited in claim 9, said system further comprising a recessed component occupying space vacated by removed portion of calvarium marrow layer.

63. A system for neural modulation in the treatment of disease, as recited in claim 9, said system further comprising a recessed component occupying space vacated by removed portion of calvarium inner table.

64. A system for neural modulation in the treatment of disease, as recited in claim 9, said system further comprising a recessed component occupying space vacated by removed portion of at least one of calvarium outer table, calvarium marrow layer, and calvarium inner table.

65. A system for neural modulation in the treatment of disease, as recited in claim 9, said system further comprising a system enclosure.

66. A system for neural modulation in the treatment of disease, as recited in claim 9, said system further comprising a system enclosure, said system enclosure including an:

(A) enclosure outer surface, and

(B) enclosure inner surface

67. A system for neural modulation in the treatment of disease, as recited in claim 66, said enclosure outer surface comprising a convex shape.

68. A system for neural modulation in the treatment of disease, as recited in claim 66, said enclosure outer surface comprising a convex shape, of similar curvature to that of the outer surface of the calvarium.

69. A system for neural modulation in the treatment of disease, as recited in claim 66, said enclosure inner surface comprising a concave shape.

70. A system for neural modulation in the treatment of disease, as recited in claim 66, said enclosure outer surface comprising a concave shape, of similar curvature to that of the inner surface of the calvarium.

71. A system for neural modulation in the treatment of disease, as recited in claim 9, said system further comprising at least one screw mount.

72. A system for neural modulation in the treatment of disease, as recited in claim 9, said system further comprising at least one screw mount, said screw mount positioned for attachment to calvarium outer table..

73. A system for neural modulation in the treatment of disease, as recited in claim 9, said system further comprising at least one screw mount, said screw mount positioned for attachment to calvarium inner table.

74. A system for neural modulation in the treatment of disease, as recited in claim 9, said system further comprising at least one mechanical attachment.

75. A system for neural modulation in the treatment of disease, as recited in claim 9, said system further comprising at least one mechanical attachment mount, said mechanical attachment mount positioned for attachment to calvarium outer table..

76. A system for neural modulation in the treatment of disease, as recited in claim 9, said system further comprising at least one mechanical attachment mount,

said mechanical attachment mount positioned for attachment to calvarium inner table.

77. A system for neural modulation in the treatment of disease, comprising:

(A) a signal conditioning circuit

(B) a sensor array in electronic communication with said signal conditioning circuit;

(C) a signal processor in electronic communication with said signal conditioning circuit

(D) a control circuit in electronic communication with said signal processor

(E) an output stage circuit in electronic communication with said control circuit

(F) a stimulating electrode array, in electronic communication with said output circuit

(G) a power conversion unit in electronic communication with at least one of said sensor array, said signal conditioning circuit, said signal processor, said control circuit, said output stage circuit, said stimulating electrode array

(H) a power delivery unit

78. A system for neural modulation in the treatment of disease, as recited in claim 77, said system further comprising a system enclosure.

79. A system for neural modulation in the treatment of disease, as recited in claim 78, said system further comprising a system enclosure, said system enclosure including an:

(A) enclosure outer surface, and

(B) enclosure inner surface

80. A system for neural modulation in the treatment of disease, as recited in claim 79, said enclosure outer surface contoured to be convex in shape.

81. A system for neural modulation in the treatment of disease, as recited in claim 79, said enclosure inner surface contoured to be concave in shape.

82. A system for neural modulation in the treatment of disease, as recited in claim 78, said enclosure designed to be recessed in calvarium.

83. A system for neural modulation in the treatment of disease, as recited in claim 78, said system further comprising mechanical attachment mount, extending from system enclosure to prevent displacement of said system enclosure into underlying neural tissue.

84. A system for neural modulation in the treatment of disease, as recited in claim 78, said system further comprising screw mount, extending from system enclosure to prevent displacement of said system enclosure into underlying neural tissue.

85. A system for neural modulation in the treatment of disease, comprising:

(A) a control circuit

(B) an output stage circuit in electronic communication with said control circuit

(C) a stimulating electrode array, in electronic communication with said output circuit

(D) a system enclosure, in mechanical communication with calvarium.

86. A system for neural modulation in the treatment of disease, as recited in claim 78, said system further comprising a power conversion unit in electronic communication with at least one of said sensor array, said signal conditioning circuit, said signal processor, said control circuit, said output stage circuit, said stimulating electrode array.

86. A system for neural modulation in the treatment of disease, as recited in claim 86, said system further comprising a power delivery unit.

87. A system for neural modulation in the treatment of disease, as recited in claim 85, said system further comprising a signal conditioning circuit.

88. A system for neural modulation in the treatment of disease, as recited in claim 85, said system further comprising a sensor array in electronic communication with said signal conditioning circuit.

89. A system for neural modulation in the treatment of disease, as recited in claim 85, said system further comprising a signal processor in electronic communication with said signal conditioning circuit.

90. A system for neural modulation in the treatment of disease, as recited in claim 9, said system employing intermittent fluctuation in neural modulation signal to reduce habituation.

91. A system for neural modulation in the treatment of disease, as recited in claim 9, said signal processor inducing intermittent fluctuation in neural modulation signal to reduce habituation.

92. A system for neural modulation in the treatment of disease, as recited in claim 9, said control circuit inducing intermittent fluctuation in neural modulation signal to reduce habituation.

93. A system for neural modulation in the treatment of disease, as recited in claim 9, said output stage circuit inducing intermittent fluctuation in neural modulation signal to reduce habituation.

94. A neural modulation system for use in treating disease which provides stimulus intensity which may be varied.

95. The device of claim 94, wherein said stimulation is at least one of activating, inhibitory, and a combination of activating and inhibitory.

96. The device of claim 94, wherein said disease is at least one of neurologic and psychiatric.

97. The device of claim 96, wherein said neurologic disease includes at least one of Parkinson's disease, Huntington's disease, Parkinsonism, rigidity, embolism, choreoathetosis, dystonia, akinesia, bradykinesia, hyperkinesia, other movement disorder, epilepsy, or the seizure disorder.

98. The device of claim 97, wherein said psychiatric disease includes at least one of depression, bipolar disorder, other affective disorder, anxiety, phobia, schizophrenia, multiple personality disorder.

99. The device of claim 96, wherein said psychiatric disorder includes substance abuse, attention deficit hyperactivity disorder, impaired control of aggression, or impaired control of sexual behavior.

100. The device of claim 94, wherein said stimulus intensity us time-varying.

101. The device of claim 100, wherein said time-varying stimulus intensity is preprogrammed.

102. The device of claim 101, wherein said time-varying stimulus intensity varies as a function of time, including but not limited to time of day, time relative to food intake, time of year, time since implantation, time since system was reprogrammed, and time since system was evaluated.

103. The device of claim 94, wherein sensory feedback is used in the determination of said stimulus intensity.

104. The device of claim 103, wherein said sensory feedback consists of at least one of electromyographic signals, accelerometers, electrodes, acoustic transducers, force sensors, pressure sensors, velocity sensors, neurotransmitter sensors, and chemical sensors.

105. The device of claim 104, wherein said sensory feedback electrodes may also function as stimulating electrodes.

106. The device of claim 104, wherein said sensory feedback electrodes record signals from at least one of the globus pallidus internus, globus pallidus externus,

internal capsule, thalamus, the subthalamic nucleus, the caudate, the putamen, the ansa lenticularis, the corticospinal tract, the substantia nigra, the nigrostriatal tract, cerebral cortex, motor cortex, premotor cortex, sensory cortex, cerebellum, cerebellar cortex, cerebellar nuclei, cerebellar projections, the brain stem, the spinal cord, central nervous system, the cranial nerves the peripheral nervous system, peripheral nerves, ganglia, sensory organs, golgi tendons, muscle stretch receptors, intrafusal fibers, and extrafusal fibers.

107. The device of claim 104, wherein said accelerometer measures movement of at least one of the head, eyes, face, jaw, neck, axial skeleton, appendicular skeleton, arms, legs, hands, feet, fingers, toes, vertebral column, and pelvis.

108. The device of claim 104, wherein said electromyographic signal arise from at least one of facial muscles, extraocular muscles, muscles of mastication, neck muscles, shoulder muscles, arm muscles, wrist muscles, hand muscles, torso muscles, chest muscles, abdominal muscles, back muscles, buttock muscles, peroneal muscles, leg muscles, calf muscles, foot muscles, and visceral muscles.

109. A device as set forth in claim 97, wherein a control law is used in the determination of the stimulus intensity as a function of input which is a combination of at least one of sensory feedback signals, preprogrammed parameters, time of day, recumbency, level of activity, adaptive parameters, estimates of system performance, and user determined input.

110. The device as of claim 109, wherein said user determined input includes at least one of magnet movement over implanted sensor, muscle contraction, joint movement, audible input, switch activation, head position, head movement, shoulder position, and shoulder movement.

111. The device as of claim 109, wherein said control law is a combination of at least one of proportional function, derivative function, integral function, nonlinear

function, multivariable function, sliding function, model reference function, adaptive function, filter function, and time-varying function of said input.

112. The device of claim 109, wherein said control law is proportional.

113. The device of claim 109, wherein said control law is of the proportional-derivative type.

114. The device of claim 109, wherein said control law is nonlinear.

115. The device of claim 109, wherein said control law is multivariable.

116. The device of claim 109, wherein said control law is sliding.

117. The device of claim 109, wherein said control law is adaptive.

118. The device of claim 109, wherein said control law is model reference.

119. The device of claim 102, wherein sensory feedback is used to estimate mental state.

120. The device of claim 119, wherein said estimated psychiatric state includes at least one of: mood, elation, depression, anxiety level, and psychosis.

121. A neurological control system for modulating the activity of at least one nervous system component, the neurological control system comprising:

at least one intracranial stimulating electrode, each constructed and arranged to deliver a neural modulation signal to at least one nervous system component;

at least one sensor, each constructed and arranged to sense at least one parameter, including but not limited to physiologic values and neural signals, which is indicative of at least one of disease state, magnitude of symptoms, and response to therapy; and

a stimulating and recording unit constructed and arranged to generate said neural modulation signal based upon a neural response sensed by said at least one sensor in response to a previously delivered neural modulation signal.

122. The system of claim 121, wherein said particular characteristic is indicative of at least one of a neurological and psychiatric condition.

123. The system of claim 121, wherein said stimulating and recording unit generates said neural modulation signal in accordance with predetermined treatment parameters to treat at least one of a neurological and psychiatric disease.

124. The system of claim 121, wherein said stimulating and recording unit comprises:

a signal processor constructed and arranged to determine neural system states; and

a control module for adjusting said at least one neural modulation signal based upon said neural system state.

125. The system of claim 121, wherein each of said at least one sensor generates one or more neural response signals, and wherein said stimulating and recording unit further comprises:

a signal conditioner, interposed between said at least one sensor and said signal processor, constructed and arranged to modify said neural response signals appropriately for said signal processor.

126. The system of claim 125, wherein said signal conditioner comprises:

at least one amplifier, each constructed and arranged to amplify said neural response signals generated by an associated one of said at least one sensor; and

at least one signal filter, each constructed and arranged to filter said amplified neural response signals generated by an associated one of said at least one sensor and an associated at least one amplifier.

127. The system of claim 126, wherein said at least one signal filter performs at least one of lowpass filtering, highpass filtering, bandpass filtering and notch filtering of said amplified neural response signal.

128. An apparatus for modulating the activity of at least one nervous system component, said system comprising:

means for delivering neural modulation signal to said nervous system component; and

means for sensing neural response to said neural modulation signal.

129. The apparatus of claim 128, wherein said delivery means comprises means for generating said neural modulation signal, said generating means comprising:

signal conditioning means for conditioning sensed neural response signals, said conditioning including but not limited to at least one of amplification, lowpass filtering, highpass filtering, bandpass filtering, notch filtering, root-mean square calculation, envelope determination, and rectification;

signal processing means for processing said conditioned sensed neural response signals to determine neural system states, including but not limited to a single or plurality of physiologic states and a single or plurality of disease states; and

controller means for adjusting neural modulation signal in response to sensed neural response to signal.

130. The apparatus of claim 129, wherein said activity is indicative of a neurologic and psychiatric disease.

131. The apparatus of claim 129, wherein said disease state includes but is not limited to Parkinson's disease, Huntington's disease, hemiballism, choreoathetosis, dystonia, akinesia, bradykinesia, restless legs syndrome, other movement disorder, epilepsy, Alzheimer's disease, dementia, other neurologic disorder, depression, mania, bipolar disorder, other affective disorder, anxiety disorder, phobia disorder, borderline personality disorder, schizophrenia, multiple personality disorder, and other psychiatric disorder.

132. The apparatus of claim 131, wherein said disease is a movement disorder.

133. The apparatus of claim 132, wherein said means for delivering neural modulation signal to said nervous system component includes electrodes implemented into at least one of the globus pallidus internus (GPi), including globus

pallidus internus internal segment (GPi,i) and globus pallidus internus external segment (GPi,e), globus pallidus externus (GPe), ventral medial (Vim) thalamic nucleus, other portion of the thalamus, subthalamic nucleus (STN), caudate, putamen, other basal ganglia components, cingulate gyrus, other subcortical nuclei, nucleus locus ceruleus, pedunculopontine nuclei of the reticular formation, red nucleus, substantia nigra, other brainstem structure, cerebellum, internal capsule, external capsule, corticospinal tract, pyramidal tract, ansa lenticularis, white matter tracts, motor cortex, premotor cortex, supplementary motor cortex, other motor cortical regions, somatosensory cortex, other sensory cortical regions, Broca's area, Wernicke's area, other cortical regions, other central nervous system structure, other peripheral nervous system structure, other neural structure, sensory organs, muscle tissue, or other non-neural structure.

134. The apparatus of claim 132, wherein said means for sensing neural response includes but is not limited to at least one of measures of disease state and response to therapy.

135. The apparatus of claim 132, wherein said means for sensing neural response includes at least one of accelerometers electromyography electrodes, acoustic sensors, intracranial electrodes, electroencephalography electrodes, and peripheral nerve electrodes.

136. The apparatus of claim 132, wherein said means for sensing neural response includes a weighted aggregate of processed signals derived from at least one of accelerometers, electromyography electrodes, acoustic sensors, intracranial electrodes, electroencephalography electrodes, and peripheral nerve electrodes.

137. The apparatus of claim 131, wherein said controller means for generating a neural modulation signal employs a control law using as input signals derived from at least one of accelerometers, electromyography electrodes, acoustic sensors,

intracranial electrodes, electroencephalography electrodes, and peripheral nerve electrodes.

138. The apparatus of claim 133, wherein said controller means for generating a neural modulation signal employs a control law using as input a weighted aggregate of processed signals derived from at least one of accelerometers, electromyography electrodes, acoustic sensors, intracranial electrodes, electroencephalography electrodes, and peripheral nerve electrodes.

139. A system for neural modulation in the treatment of disease, comprising:

(A) a sensor array in electronic communication with said signal conditioning circuit;

(B) a signal processor in electronic communication with said signal conditioning circuit

(C) a control circuit in electronic communication with said signal processor

(D) an output stage circuit in electronic communication with said control circuit

(E) a stimulating electrode array, in electronic communication with said output circuit

140. A system as in claim 139, further comprising a system enclosure implanted in the calvarium.

141. A system as in claim 139, further comprising a system enclosure with at least one convex surface.

142. A system as in claim 140, further comprising a system enclosure implanted in the calvarium with a calvarium stabilization lip.

143. A system as in claim 140, further comprising a system enclosure with attachment means for mechanical attachment to calvarium

144. A system as in claim 143, wherein said attachment means include at least one hole.

145. A system as in claim 143, wherein said attachment means include at least one threaded hole.

146. A system as in claim 143, wherein said attachment means include at least one hole positioned for placement of a suture through said hole.

147. A system as in claim 146, wherein said hole facilitates attachment of suture to periosteum.

148. A system as in claim 139, said stimulating electrode array mechanically attached to intracranial catheter.

149. A system as in claim 148, said intracranial catheter including at least one microelectrode.

150. A system for neural modulation in the treatment of disease, comprising:

(A) a system enclosure, in mechanical communication with calvarium;

(B) a control circuit in electronic communication with said signal processor

(C) an output stage circuit in electronic communication with said control circuit

(D) a stimulating electrode array, in electronic communication with said output circuit

151. A system as in claim 150, further comprising intracranial catheter, said stimulating electrode array mechanically attached to intracranial catheter.

152. A system as in claim 151, said intracranial catheter including at least one microelectrode.

153. A system as in claim 151, said intracranial catheter including at least one microelectrode tunnel.

154. A system as in claim 150, said system enclosure including at least one intracranial catheter port.

155. A system as in claim 154, said intracranial catheter port positioned at the center of said system enclosure.

156. A system as in claim 155, said intracranial catheter port positioned at the periphery of said system enclosure.

157. A system as in claim 150, said system enclosure including catheter recess.

158. A system as in claim 157, said catheter recess containing means for electrode contact between system enclosure and intracranial catheter

159. A system as in claim 150, further comprising catheter stabilization means.

160. A system as in claim 159, wherein said catheter stabilization means includes a catheter mount ball.

161. A system as in claim 160(31), wherein said catheter mount ball includes a catheter ball channel.

162. A system as in claim 159, wherein said catheter stabilization means includes a catheter insertion mount.

163. A system as in claim 162, wherein said catheter insertion mount includes catheter mount system enclosure attachment means.

164. A system as in claim 162, wherein said system enclosure includes system enclosure catheter mount attachment means.

165. A system as in claim 159, wherein said catheter stabilization means includes a catheter locking mechanism.

166. A system as in claim 165, wherein said catheter locking mechanism includes a compressible material.

167. A system as in claim 166, wherein said compressible material is compressed against intracranial catheter.

168. A system as in claim 165, wherein said catheter locking mechanism includes a catheter mount ball locking screw.

169. A system as in claim 168, wherein said catheter mount ball locking screw provides force to compress said catheter locking mechanism.

170. A system as in claim 150, further comprising at least one electrode contact.

171. A system as in claim 170, wherein said electrode contact is in mechanical connection to said system enclosure.

172. A system as in claim 170, wherein said electrode contact is contained within catheter recess.

173. An intracranial catheter for use in the treatment of disease, comprising at least one stimulating electrode and at least one microelectrode.

174. An intracranial catheter as in claim 173, wherein said microelectrode is attached to a microelectrode shaft which is positioned along the longitudinal axis of said intracranial catheter.

175. An intracranial catheter as in claim 173, wherein said microelectrode is attached to a microelectrode shaft which is parallel to the longitudinal axis of said intracranial catheter.

176. An intracranial catheter as in claim 173, wherein said microelectrode is removable.

177. A system as in claim 150, further comprising intracranial catheter

178. A system as in claim 150, further comprising a multiplicity of intracranial catheter

179. A system as in claim 150, further comprising a multiplicity of intracranial catheter, elements of said stimulating electrode array mechanically attached to at least one of intracranial catheter.

180. A system as in claim 150, further comprising at least one microelectrode attached to at least one of intracranial catheter.

181. A system as in claim 151, said stimulating electrode array comprising a conducting film mechanically attached to intracranial catheter.

182. A system as in claim 151, said stimulating electrode array comprising a conducting layer deposited on intracranial catheter.

183. A system as in claim 152, said conducting film deposited using microfabrication

process, including but not limited to electron beam deposition, sputtering, plasma enhanced chemical vapor deposition.

184. A device for neuromodulation, comprising

a. electronic circuit

b. enclosure [casing] means for enclosing said electronic circuit

c. securing means for securing said casing to calvarium

d. electrode means for delivering electrical stimulus to tissue

185. A device for neuromodulation, comprising

a. electronic circuit

b. enclosure [casing] means for enclosing said electronic circuit in close proximity to the calvarium

c. electrode means for delivering electrical stimulus to tissue

186. A device for neuromodulation, comprising

a. electronic circuit

b. enclosure [casing] means for enclosing said electronic circuit within a region from which bone was removed from the calvarium

c. electrode means for delivering electrical stimulus to tissue

187. A device as in claim 184 wherein said device is cylindrical.

188. A device as in claim 185 wherein said device has a diameter less than 6 centimeters.

189. A device as in claim 186 wherein said device has a diameter less than 5 centimeters.

190. A device as in claim 184 wherein said device has a diameter less than 4 centimeters.

191. A device as in claim 185 wherein said device has a diameter less than 3 centimeters.

192. A device as in claim 186 wherein said device has a diameter less than 2

centimeters.

193. A device as in claim 184 wherein said device has a diameter less than 1 centimeters.